

PROPOSED TITLE 19 CHANGES

Hybrid Rocket Motors — Definitions and License Scope

Title 19, California Code of Regulations, Chapter 6, §§ 980 and 981.5

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Submitted to:

CAL FIRE — Office of the State Fire Marshal (OSFM)

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Scope

This package proposes hybrid rocket motor definitions in § 980 and new standalone license-scope paragraphs in § 981.5. Those paragraphs are separate from the published solid-motor rules. This package does not propose liquid-motor definitions or pyro-operator changes for liquid rocket motors.

Nomenclature

CAL FIRE — Office of the State Fire Marshal (OSFM) is referred to as “State Fire Marshal” in proposed regulatory text to align with existing Title 19. Experimental is the preferred term. Experimental motors may also be referred to as research motors, to align with NAR and TRA. License titles use the published term Pyrotechnic Operator—Rockets First / Second / Third Class. After the class is named, Title 19 says “such operator.”

Relation to the Motor Classification ISOR (rev 3)

This package supports the ISOR as written, including the High Power Rocket Motor definition and new § 986.10. Certified solids stay with the ISOR. The Second Class Experimental Hybrid launch rule and the Third Class Certified Hybrid launch rule are new standalone paragraphs. They do not amend, strike, or replace published § 981.5(b)(5) or (b)(6).

Legend

Blue underlined italic text = proposed NEW Title 19 language. Existing solid-motor rules are left as published.

Part A. Proposed § 980 definitions

Certified Motor

Proposed text (NEW)

Certified Motor. A commercially manufactured rocket motor certified by the Tripoli Rocketry Association (TRA), the National Association of Rocketry (NAR), the Canadian Association of Rocketry (CAR), or by other means acceptable to the State Fire Marshal.

Justification

Parent certification-status term. A Certified Hybrid inherits this status without restating the certifying bodies in every architecture definition. Classification of certified commercial motors still runs through ISOR § 986.10.

Experimental Motor

Proposed text (NEW)

Experimental Motor. A rocket motor that is not certified by NAR, TRA, or CAR, or by other means acceptable to the State Fire Marshal.

Note: Experimental motors may also be referred to as research motors.

Justification

Two classes only — Certified or Experimental. Architecture is not the class.

Fuel Grains

Review heading only. § 980 is alphabetical; each term below would be placed under F, I, or S.

Proposed text (NEW)

Fuel Grain. A solid fuel component of a rocket motor. A Fuel Grain is either a Solid Rocket Fuel Grain or an Inert Fuel Grain.

Solid Rocket Fuel Grain. A solid grain that contains fuel and an oxidizer in solid form. A grain that contains any oxidizer is a Solid Rocket Fuel Grain, including when a non-solid oxidizer is also used. A motor that uses a Solid Rocket Fuel Grain shall be treated as a solid rocket motor and shall be subject to the requirements applicable to solid rocket motors.

Inert Fuel Grain. A solid grain that contains fuel and does not contain an oxidizer. It remains inert and non-propulsive until a non-solid oxidizer is added. Examples include, but are not limited to, polyethylene, nylon, or cast rubber, when manufactured without oxidizer.

Justification

Gives an inspector a yes/no test: is oxidizer mixed into the grain? Metal additives such as aluminum or magnesium are fuel and do not make the grain a Solid Rocket Fuel Grain. NFPA 1125 / 1127 do not define “inert fuel grain.” NFPA treats a solid-propellant rocket motor as fuel and oxidizer in solid form, and a hybrid rocket motor as fuel and oxidizer in different physical states.

Hybrid Rocket Motor

Proposed text (NEW)

Hybrid Rocket Motor. A rocket motor that utilizes an Inert Fuel Grain and a non-solid oxidizer.

Justification

Parent architecture term. NFPA 1127: a rocket motor that utilizes a fuel and an oxidizer in different physical states. This definition adds the Inert Fuel Grain limit. It does not assign a license class. It is not limited to nitrous oxide.

Nitrous Oxide Hybrid Rocket Motor

Proposed text (NEW)

Nitrous Oxide Hybrid Rocket Motor. A Hybrid Rocket Motor utilizing an Inert Fuel Grain and nitrous oxide as the oxidizer.

Justification

Names the oxidizer used in today's certified sport hybrids. A subtype, not a closed list. A NAR, TRA, or CAR certified hybrid that uses another non-solid oxidizer, is a Certified Hybrid Rocket Motor.

Certified Hybrid Rocket Motor

Proposed text (NEW)

Certified Hybrid Rocket Motor. A Hybrid Rocket Motor certified by NAR, CAR, or TRA, or by other means acceptable to the State Fire Marshal.

Justification

Named subset of Certified Motor. Includes certified hybrid if the grain is an Inert Fuel Grain. Classification still runs through ISOR § 986.10.

Experimental Hybrid Rocket Motor

Proposed text (NEW)

Experimental Hybrid Rocket Motor. A Hybrid Rocket Motor not certified by NAR, CAR, or TRA, or by other means acceptable to the State Fire Marshal.

Note: This may also be referred to as a Research Hybrid Rocket Motor.

Justification

Named subset of Experimental Motor. Not limited to nitrous oxide. An uncertified motor whose grain contains oxidizer is addressed in the Second Class Experimental Hybrid launch rule, not in this definition.

Pad-Filled Vented Hybrid

Proposed text (NEW)

Pad-Filled Vented Hybrid. A Hybrid Rocket Motor that uses a vented flight cylinder and that is not filled with oxidizer until it is at the launch pad. A vented flight cylinder is a flight cylinder used in a hybrid rocket motor system that continuously vents a pressurized liquid or gas to the atmosphere during the motor fill and ignition procedures. An ignition device or Preheater may be installed during assembly. The motor is non-propulsive until filled with oxidizer.

Justification

Uses the NFPA 1125 vented flight cylinder term and the NFPA 1127 pad-fill and ignition-device rule. A prefilled sealed GOX bottle already on the rocket is not a Pad-Filled Vented Hybrid. A Preheater does not reclassify the motor as a solid rocket motor.

Preheater

Proposed text (NEW)

Preheater. A small initiating device, separate from the Inert Fuel Grain, containing not more than 62.5 grams of fuel, oxidizer, or other heat-producing compound. The 62.5-gram limit applies to that energetic material and does not include hardware. It is initiated by an ignition system and produces the heat necessary to start propulsion of a Hybrid Rocket Motor. An ignition system may include an igniter, a spark device, or another device. A Preheater may be a small piece of Solid Rocket Fuel Grain, Pyrodex, or another heat-producing compound. A Preheater is not the Inert Fuel Grain, is not Oxidizer Loading, and is not a Hybrid Rocket Motor. Adding a non-solid oxidizer to an Inert Fuel Grain is Oxidizer Loading; it is not a Preheater. A Preheater does not change the classification of a Hybrid Rocket Motor that uses an Inert Fuel Grain into that of a solid rocket motor.

Justification

The Preheater is a separate initiator. Filling an Inert Fuel Grain with oxidizer is Oxidizer Loading and cannot be described as a Preheater. The 62.5-gram figure is the NFPA 1122 / 1125 and DOT Special Provision 51 model-rocket propellant limit. Those codes do not define a Preheater. The number is not a Department of Transportation “no hazmat” exception.

Assembly (Hybrid Rocket Motor)

Proposed text (NEW)

Assembly (Hybrid Rocket Motor). May include all aspects of assembling the motor, including the installation of an Inert Fuel Grain and a Preheater. Assembly does not include the addition of an oxidizer.

Justification

Grain and Preheater are assembly. Oxidizer is Oxidizer Loading. NFPA 1125 / 1127 do not define this term.

Production (Hybrid Rocket Motor)

Proposed text (NEW)

Production (Hybrid Rocket Motor). May include all aspects of fabrication of the motor and Inert Fuel Grain except adding oxidizer.

Justification

Adding oxidizer is Oxidizer Loading, not production. NFPA 1125 / 1127 do not define this term.

Oxidizer Loading

Proposed text (NEW)

Oxidizer Loading. The addition of a non-solid oxidizer to the rocket motor. This is distinct from installing an Inert Fuel Grain, distinct from installing a Preheater, and distinct from loading liquid fuel. Oxidizer Loading is not a Preheater.

Justification

The act that makes a vented hybrid propulsive. Occurs on the pad. Consistent with NFPA 1127: a vented hybrid is non-propulsive until filled with oxidizer. NFPA does not use this defined term.

Part B. Proposed NEW § 981.5 paragraphs

Published § 981.5(b) is titled Pyrotechnic Operator. Published rocket classes are Pyrotechnic Operator—Rockets First Class, Second Class, and Third Class. After the class is named, Title 19 says “such operator.” Existing (b)(5) solid-fuel experimental language is not amended. Existing (b)(6) high-power-rocket language is not amended.

Experimental Hybrid — license scope

Pyrotechnic Operator—Rockets Second Class

Published solid rule — left unchanged

§ 981.5(b)(5). Pyrotechnic Operator—Rockets Second Class may conduct and is restricted to all activities in connection with research experiments, production, transportation, fuel loading and launching of all types of solid fuel experimental rockets only. Such operator shall also be responsible for the actions and conduct of all assistants. Operators licensed under subsection (b) are also required to obtain a local permit from the authority having jurisdiction prior to all launches.

Proposed NEW paragraph (separate from the solid rule)

A Pyrotechnic Operator—Rockets Second Class may launch Experimental Hybrid Rocket Motors. Such operator shall also be responsible for the actions and conduct of all assistants. A local permit from the authority having jurisdiction is required prior to launch.

An Experimental Hybrid Rocket Motor whose fuel grain contains oxidizer shall be launched as an Experimental Hybrid by a Pyrotechnic Operator—Rockets Second Class. Handling, storage, and supervision of that grain shall be the same as for a solid fuel experimental rocket. Oxidizer Loading remains a hybrid pad operation. This motor is not eligible for the inert-grain handling exception.

Suggested placement

New paragraph immediately following published § 981.5(b)(5). Do not strike “only” from the solid sentence.

Justification

An Experimental Hybrid that uses an Inert Fuel Grain is not a solid fuel experimental rocket. A separate paragraph keeps the published solid rule intact. The second proposed paragraph is the homemade grain that contains oxidizer: launched as an Experimental Hybrid; grain handled as a solid; no inert-grain storage exception. Launch only; not wholesale, import, or sale.

Certified Hybrid — license scope

Pyrotechnic Operator—Rockets Third Class

Published high-power rule — left unchanged

§ 981.5(b)(6). Pyrotechnic Operator—Rockets Third Class may purchase, transport, store, and launch high power rockets. Experimental high power rocket motors may only be imported, exported, and wholesaled by individuals or companies holding valid import, export, or wholesale licenses. Pyrotechnic Operators—Third Class may only purchase high powered rocket motors from licensed wholesalers. Operators licensed under subsection (b) are also required to obtain a local permit from the authority having jurisdiction prior to all launches.

Proposed NEW paragraph (separate from the high-power solid rule)

A Pyrotechnic Operator—Rockets Third Class may launch Certified Hybrid Rocket Motors. Such operator shall also be responsible for the actions and conduct of all assistants. A local permit from the authority having jurisdiction is required prior to launch.

Suggested placement

New paragraph immediately following published § 981.5(b)(6). Do not edit the published high-power-rocket sentence.

Justification

Any Hybrid Rocket Motor certified by NAR, TRA, or CAR launches under Third Class, with an Inert Fuel Grain. Does not narrow existing high-power-rocket authority.

Inert Fuel Grain — purchase, transport, assembly, production, and storage

Proposed text (NEW)

Hybrid rocket motors that utilize an Inert Fuel Grain do not require a pyrotechnic operator license to purchase, transport, assemble, or store, provided the oxidizer is maintained separately from the motor until Oxidizer Loading on the pad. Hybrid production may be performed without a pyrotechnic operator license for Experimental Hybrid Rocket Motors, and under any limitations of the certifying organization for Certified Hybrid Motors. A Preheater is separate from the Inert Fuel Grain and shall not change the classification of a Hybrid Rocket Motor that uses an Inert Fuel Grain into that of a solid rocket motor. Adding oxidizer to an Inert Fuel Grain is Oxidizer Loading, not use of a Preheater. A motor whose fuel grain contains oxidizer is not eligible for this exception.

Current Title 19

§ 1033 is written for experimental high power (solid) motors. There is no hybrid exception.

Justification

An Inert Fuel Grain plus empty vented flight cylinder is not a pre-mixed solid motor. NFPA 1127: non-propulsive until oxidizer fill. A prefilled oxidizer already on the rocket does not qualify. Launch still requires the applicable Second Class or Third Class hybrid launch rule and a local permit. N₂O or other oxidizer in DOT cylinders remains under existing compressed-gas rules.

Part C. Effect map

What is in the grain?	Also using non-solid oxidizer?	Treatment
No oxidizer — Inert Fuel Grain	Yes (N ₂ O or other non-solid)	Hybrid. Second Class or Third Class hybrid launch rule, and the inert-grain handling exception.
Oxidizer in the grain — Solid Rocket Fuel Grain	No	Solid motor. Published solid rules. Not this package.
Oxidizer in the grain — Solid Rocket Fuel Grain	Yes (quasi-hybrid / fuel-rich)	Grain handled as solid. If experimental, launched as an Experimental Hybrid. Not eligible for the inert-grain handling exception.

Part D. Requested OSFM actions

1. Adopt the Motor Classification ISOR (rev 3) as written.
2. Add the Part A hybrid definitions to § 980.
3. Add the Second Class Experimental Hybrid launch paragraph after § 981.5(b)(5), including the sentence for an experimental motor whose grain contains oxidizer. Do not amend the published solid-fuel Second Class sentence.
4. Add the Third Class Certified Hybrid launch paragraph after § 981.5(b)(6). Do not amend the published high-power Third Class sentence.
5. Adopt the inert-grain handling exception for Inert Fuel Grain hybrids only.

Respectfully submitted to CAL FIRE — Office of the State Fire Marshal (OSFM),

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